THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LVIII.—No. 11. Whole No. 927. | NEW YORK, MONDAY, MARCH 13, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY, COLUMBUS, O., Feb. 27, 1893.

To the Members of the Ohio Gas Light Association:

The Ninth Annual Meeting of the Ohio Gas Light Association will be held at Columbus, O., on March 15 and 16, 1893.

The meeting will be called to order at 10 A. M. (Standard time), on the first named day.

The arrangements for the meeting will be the same as they were last year. The sessions will be held in the Employees' Hall of the Columbus Gas Company, corner of Long and Front streets, and the hotel headquarters will be the Chittenden, one square distant. Members are advised to secure rooms in advance.

The following papers have been promised:

1. "The Present State of the Art of Purification in Closed Vessels," by S. F. Hayward, New York City.

2. "A Test of the Backus Heater," by Jerome Penn, Washington Court House, O.

3. "Should Small Gas Companies Put in Electric Light Plants?" by H. L. Hurlburt, Oberlin, O.

4. "Is the Wilkinson Process Economical for a Small Works?" by J. F. Seamon, Uniontown, Pa.

5. "Discrimination by Gas Companies in the Treatment of their Consumers," by G. A. Allen, Zanesville, O.

6. "Governor Burners," by Irvin Butterworth, Columbus, O.

7. "Oils for Gas Enriching," by A. S. Miller, Chicago, Ills.

8. "The Present and Future Competition of Gas and Electricity," by Joseph Gwynn, Steubenville, O.

There will be the usual "Question Box," for which members are requested to send to the Secretary, well in advance of the meeting, any questions which they desire to have answered. The Executive Committee has also recommended that a portion of one session be set apart for "miscellaneous discussions."

The meeting promises to be interesting, and it is hoped there will be the usual generous attendance. Visitors will be welcome.

Membership application blanks may be had of the Secretary.

Respectfully, IRVIN BUTTERWORTH, Secretary.

BRIEFLY TOLD.

A SUGGESTION TO FOREIGN GAS MEN WHO PROPOSE TO VISIT THE WORLD'S FAIR.—It is fair to presume that many working members of the European fraternity of gas makers will visit the States this year, their main objective point, of course, being the scene of the World's Fair, which Chicago assures everybody will be opened some time in May; and the knowledge that this coming to us of our confreres on the other side of the Atlantic also may mean to them considerable personal discomfort—vexation, perhaps, would better express it—it is only in line with what American gas makers are willing and anxious to do for their visiting brethren that the suggestion is made that the visitors time their arrival in Chicago for the week in which the convention of the American Gas Light Association is to be held—the third week of October. Those who so adjust their travelling programme may count on a hearty welcome, and on the best efforts of the members of the Association to cause their stay to be as free as possible from the vexations likely to arise in the course of "doing the Fair." We know that this matter has been the subject of much earnest discussion of late amongst those high in the executive management of the American Association, and that all are agreed in the hope that our visiting confreres will practically indorse the suggestion. Those who prefer to visit the Fair in its earlier stages ought to bear in mind that the Western Association will convene in Chicago in the third week of May, and its executives and members hold themselves in readiness to welcome and care in their own inimitable way for those from abroad who shall find themselves in Chicago during that time. Oh, the pity of it; that the proposed separate gas exhibit could not have been perfected.

THE MEETING OF THE OHIO ASSOCIATION.—We are indebted to Secretory Butterworth for an advance copy of the programme arranged for the meeting this week of the Ohio Gas Light Association, and a perusal of the same goes to show that in so far as completeness of preparation is concerned, nothing has been left undone to secure a successful result. President Welch and his executive associates have worked together in

very nice harmony, with the result that a good paper list is ready for discussion, and the question box also is filled with problems that look to be provocative of brisk dialogues. It is measurably certain that the East will be numerically well represented at the meeting, although the representation undoubtedly would be larger were it not for the depressing fact that the troubles incident to the past (we might, with truth, say the present) formidably severe winter are not yet over with. Indeed, it would not be strange if the general attendance at the meeting suffered from the same cause. Those who can possibly arrange it, however, even at some personal inconvenience, ought to be on hand at the meeting, if for no other reason than they will be likely to gain much by an interchange of experiences gained in this most aged of old-fashioned winters. These happenings are told so much better when the recital is made close to the time in which they occurred.

The Talk of Consolidation at Newark, N. J.—During the past month or so the newspapers of this and other vicinities have several times had the gas interests of Newark consolidated, sold out, or otherwise disposed of; but up to the 10th of March the Gas Companies of New Jersey's busiest city have preserved their individuality. Furthermore, speaking in respect of the immediate future, there is no striking danger that things are not to go on in Newark, in the instance of the gas supply, as these have been conducted for the past 8 years. In our item columns for this week a report of an agreement between the local authorities and the two Gas Companies (the Newark and the Citizens), as to the rates at which gas is to be supplied to the city and to ordinary consumers for a period of 10 years is given. And the agreement is positive evidence that those who have controlled these Companies so well for many years show no desire to relinquish the management of their splendidly equipped properties. Under the agreement the city as to its public buildings will pay $1.25 for each 1,000 feet of gas consumed, and the gas supplied to its public lamps will net the Companies about 90 cents per 1,000. The most important concession, however, is that granted to ordinary consumers, who, during the 10 years of the agreement, are guaranteed gas at the net rate of $1.40 per 1,000. In return for these concessions the city consents to keep alive the covenants of the contract arranged in 1884, which covenants insure to the Companies the exclusive right to manufacture and supply gas in their respective districts.

An Ill-Favored Bit of Legislation.—The open handed gentlemen who are at present controlling the law making machinery of New York State, appear to have made a direct clutch at the gas business of Buffalo, for we cannot conceive that such freebooting privileges would be asked for by others than those who are of the innermost circle. No; it looks that "the leaders" are behind the movement to capture the gas supply of Buffalo, just as in years gone by some of the others of the ill-favored crew managed to take up the gas properties of Albany and Troy. The bill referred to, which is little short of extraordinary in the scope of its possibilities, provides, "The Queen City Gas Light Company, of Buffalo, shall have the right, and it is hereby empowered to supply gas in the towns, villages and cities of the counties of Erie and Niagara, and for that purpose is hereby authorized, without other or further authority of law or ordinance, to lay and maintain requisite conductors, mains and pipes through and under any streets, avenues or public places of such cities, towns and villages. And for the purpose aforesaid, such corporation shall have the right and is hereby empowered to lay and maintain such conductors, mains and pipes under and across any intervening land belonging to the cities, towns and villages in Erie and Niagara counties, or to private persons, at such places as it may determine." This is broad enough, surely; nor is the local authority of Buffalo permitted to say a word about it. The fact is, though, "the leaders" ought to remember that the capture of the gas supply of Buffalo means a different sort of struggle to that they emerged from so victoriously in Albany and Troy; for the Buffalo Companies have been managed on a common-sense policy, and very differently from the financial management pursued at Albany and Troy, prior to the capture of the latter. Gas is at a low price in Buffalo; very much lower, in fact than is the rule in "the leaders'" gas bailiwicks of Albany and Troy.

Notes.—The Elmira (N. Y.) gas works will be remodelled this season. Col. Robinson says so, and he means it.——Mr. E. U. Terwilliger bid in the plant of the Ellenville (N. Y.) works, at foreclosure sale, for the sum of $10,850, which was the amount of the first mortgage debt. ——Six hundred shares of the capital stock of the Lawrence (Mass.) Gas Light Company were recently sold at auction, the range being $127 to $131 per share.

[Offical Report—Revised by the Secretary—Concluded from Page 333.]

TWENTY-THIRD ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 15 and 16, 1893.

Second Day—Morning Session.

The second day's session was begun at 10 A. M., Thursday, Feb. 16th.

Committee to Investigate the Effect of the Trolley System on Gas and Water Pipes.

Mr. Stiness—At the meeting yesterday the suggestion was made that a committee be appointed to investigate the effect of the trolley system on our gas and water services. As this is a matter of considerable importance to most of us, I wish to offer the following resolutions:

Voted, That a committee be appointed to investigate the action of electricity on gas and water services, such committee to report to the President, and that the report be printed for distribution to the members.

Voted, That the President be, and he is hereby authorized to approve any bill of expenses incurred in the discharge of this duty.

If the committee should find it a matter of importance, it seems to me it would be better to have the report printed and distributed among the members at once, rather than wait for the next annual meeting. I know it sometimes occurs that members of the committee appointed by the Association are obliged to incur some expenses, and I think the Association should bear those expenses instead of putting them upon the committee. It seems to me that, perhaps, it may be of a great deal of importance to us to have the committee make an immediate report.

The resolutions were adopted.

The President—The committee will be as follows: W. R. Addicks, C. F. Prichard, W. A. Learned.

Report of Committee on President's Address.

Mr. Greenough, of the committee on President's address, presented the following report:

The committee on the President's address concur in his recommendations as to preparing a volume of 5 years of the proceedings of this Association, indexing all its proceedings, and preparing a list of its members. They would suggest, however, that one committee would do the work better than three, as there would be advantages in co-operation. A committee of six could work in sub-committees of two, and they would recommend that the President appoint such a committee of six, who shall be instructed to prepare a list of the past and present members, with the dates of their admission, and of their decease, if dead; also, an index of our proceedings from the beginning, and the proceedings in full for as many years as shall seem on the whole advisable to the committee, the expenses attendant upon this work to be charged to the Association.

M. S. Greenough,
C. J. R. Humphreys,
A. B. Slater, Jr.,
} Committee.

Mr. Greenough—The committee thought that was a matter which had better be left to be further considered by the committee, and they might determine whether it was within our means to publish the proceedings for more than 5 years, or whether the expenses of the whole shall prove to be so much that they would have to abandon the printing of any extended amount of proceedings. Of course, the expense of doing this work will have to be borne by the Association, and it will be a question of how much money they can properly expend in that direction.

The President—You have heard the report of the committee. What is your pleasure with regard to it?

Mr. Stiness—I move that the report be received, and the recommendation adopted. (Carried.)

The President—I will announce that committee before we adjourn.

The several committees appointed to prepare memorials of deceased members were given permission to submit their reports after adjournment, and the Association directed that the same be printed with the proceedings.

The President—We have one more paper on our list, which came, to the great relief of our Secretary, from the other side of the country. I wish to say, before it is read, that the Directors, and all of you, as I know, are very much indebted to Mr. Jones for taking so much interest and showing us so conclusively that he still retains his interest in the old Association. In fact, we have had similar experiences before, and it seems to me that it is impossible for a man who has once belonged to

the Association to get so far away as to be able to forget it. His telegram, which was read last evening, also showed the same kindly spirit and good feeling. I am sure you will all agree with me that we are indebted to Mr. Jones for his contribution. The Secretary will read the paper by Mr. E. C. Jones, of the San Francisco (Cal.) Gas Light Company, on

EVERYDAY PYROMETRY.

The measurement of the temperature of retorts and furnaces has hitherto been attended with so much trouble, and, at best, lack of correctness, that it has been but little practiced by the practical gas engineer, and has become the prerogative of the chemists of the larger gas companies. Every one interested in gas making feels the desirability of having ready at hand an easy method of determining high temperatures and comparing the heat of one retort or furnace with another, hence my reason for presenting this paper on a bye-way of the gas business.

The object of this paper is to describe a photo-pyrometer for comparing high heats, and a series of fusible alloys for determining the temperature. How many of us have been taught that when a retort is "cherry red" it is 1,650°; when it is a "bright cherry red" it is 1,830°; when it is "dull orange" it is 2,010°; and at 2,190° F. it is "bright orange!" The vagueness of this comparison may not have been apparent to Kahn and Becquerel, its originators, but it is brought out in full force by looking at a California fruit stand, where hundreds of boxes of cherries are exhibited, ranging in color from the lightest yellow through all the shades of yellow and red to almost black; while native oranges present every shade of color from yellow to red, in contrast with the dark-skinned Japanese variety. The difficulty of judging between the various colors presented by a stack of benches of hot retorts was brought forcibly to my notice last summer while making a competitive test of different full-depth regenerative furnaces, preparatory to the adoption of a setting for a new stack of 20 benches of "9's." A careful account was kept of the percentage of coke used for fuel, the temperature and composition of waste gases, and, in fact, all the details necessary to a complete test, yet the result was not entirely satisfactory; for while one type of bench required 22 per cent. of coke for fuel, another required 25 per cent., and when the retorts of both benches were drawn at the same time, the heats were apparently the same, still there was a lingering suspicion that the retorts in the bench using the most fuel were slightly hotter than those in the other. The relative heat of the retorts was decided to be an important factor in the test. This led to the devising of a little instrument for making exact and unfailing comparison between retorts in the same bench and other benches. The instrument is an oblong tin box, about 4 inches long, 1¼ inches wide, and 2¾ inches deep, with a hinged cover. At one end of the box is fitted an eye piece, and directly opposite is a hole ¼ inch in diameter, corresponding to the eye piece. The inside of the box is fitted with grooves, in which slide 20 pieces of evenly flashed blue glass, 1 inch square. Each piece of glass is fastened to a short wire, passing out through the bottom of the box, to facilitate sliding it backward and forward behind the eye piece. This inexpensive little instrument solved the vexatious problem of comparative heats, not in degrees Fahrenheit, but in actual percentage of heat—hotter or less hot than an established standard.

The method of using it is to push all the glass slides back of the eye piece and stand at a convenient distance, say 10 feet, from the front of a retort, from which the coke has been drawn; raise the eye piece to the eye and draw aside the glasses until the light of the hot retort is visible, then count the number of glasses remaining back of the eye piece, note the number on a diagram of the bench and repeat the test with each retort in the bench. By following this method through a stack of benches one is enabled to determine to a nicety whether a retort or a bench is hotter or less hot than another retort or bench; and if a retort is selected as being at the desired temperature for making gas, and the light from the retort is visible through, say, 14 glasses, then each deviation above or below of one glass would represent a difference in temperature of 7¼ per cent.

The accuracy of the photo-pyrometer is due to the fact that all solid bodies begin to be visibly hot at the same temperature, and the intensity of the light emitted is always the same at the same degree of heat. Before placing this instrument in actual use I feared that its correctness might be affected by the well known law of inverse squares on which the measurement of light is based, and to demonstrate this *pro* or *con*, a series of experiments were tried, using it on retorts of various lengths and at different distances, and I found that any slight difference in distance within the bounds of an ordinary retort house does not materially affect its correctness. Yet an established distance of, say, 10 feet from the mouthpiece would be well to adopt in its use. In making an instrument of this kind, care must be taken that all the small glasses are cut from the same sheet and that the film of color is of even thickness. In connection with this photo-pyrometer I use the "metall pyrometer," prepared by the Deutsche Gold und Silber Scheide Anstalt, of Frankfort-on-the Main.

The metal pyrometer consists of a series of 27 metals and alloys, prepared in convenient thin strips, and the melting point of each is carefully determined by the air thermometer. The following is a list of the series which I use, giving the composition of the alloy and the melting point in both Centigrade and Fahrenheit degrees:

	Melting Point—Deg. C.	Deg. F.
Cadmium	315	599
Zinc	412	773.6
Aluminum	620	1,148
Silver, 800; copper, 200	850	1,562
Silver, 950; copper, 50	900	1,652
Silver	954	1,749.2
Silver, 400; gold, 600	1,020	1,868
Gold	1,075	1,967
" 950; platinum, 50	1,100	2,012
" 900; " 100	1,130	2,066
" 850; " 150	1,160	2,120
" 800; " 200	1,190	2,174
" 750; " 250	1,220	2,228
" 700; " 300	1,255	2,291
" 600; " 400	1,320	2,408
" 550; " 450	1,350	2,462
" 500; " 500	1,385	2,525
" 450; " 550	1,420	2,588
" 400; " 600	1,460	2,660
" 350; " 650	1,495	2,723
" 300; " 700	1,535	2,795
" 250; " 750	1,570	2,858
" 200; " 800	1,610	2,930
" 150; " 850	1,650	3,002
" 100; " 900	1,690	3,074
" 50; " 950	1,730	3,146
Platinum	1,775	3,227

The strips ot metal may be purchased by weight in any quantity, and any number of the series may be purchased separately. Usually about 1 gramme of each forms a set sufficient for 50 or more experiments, and the temperature of any part of a furnace or retort may be easily ascertained in 10 minutes at a cost of but a few cents. These alloys provide the gas engineer with a rapid, positive and cheap means of carrying on experiments relating to high temperatures. I have tried several methods of using the metal pyrometer in order to find out the simplest and best. I first arranged little pieces of the alloys, covering a range of about 500°, on a firebrick, having a number of small depressions to receive them; the firebrick proved too heavy and cumbersome in handling. I then tried cupels made of bone ash, but found they would crack and disintegrate at high temperatures, especially when subjected to sudden change of temperature. The best method is to use a small, thin, roasting dish of Denver or Battersea ware, about 2 inches in diameter, and shaped like a small saucer. This is easily handled, and may be placed in any part of a furnace, and will withstand the highest temperature to be found in any regenerative furnace. To test the heat of a retort, I cut pieces of alloys about the size of a pinhead, with melting points ranging from 1,500° to 1,900° F., and place them in the roasting dish. I then place the dish well back in the retort, after the hot coke has been drawn, and put on a lid loosely. At the end of 10 minutes I remove the dish. Some of the alloys will be fused to a small round ball, while others are either bent or unaffected by the heat. Suppose a series of 4 alloys, with melting points of 1,652°, 1,749°, 1,868°, and 1,967°, respectively, to be placed in a retort, and, on withdrawing the dish, it is found that two are fused to small balls, the third is bent, and shows signs of having been affected by the heat, while the fourth is wholly unaffected. Then it is known that the heat of the retort was above 1749°, and below, yet very near to, 1868°. I have arranged these alloys in small paper boxes, conveniently arranged according to the melting points, in a tin box, in compartments, and all the apparatus necessary, including the box of alloys, does not occupy more space than an ordinary text book.

In using the metal pyrometer for determining temperatures I always use, in connection with it, the blue glass photo-pyrometer; thus, the temperature of a retort being known, I mark the box opposite the glass through which the heat is visible with the number of degrees; and I am gradually getting a box of blue glasses that will give the various tem-

peratures, in degrees Fahrenheit, as well as in percentage of heat, with a fair amount of correctness. It is a simple matter to adjust one of these little instruments by experiments with the alloys, and innumerable uses will be found for it around a gas works.

The results of my experiments with high temperatures would swell this paper to a tiresome length, but a summing up of all of them brings out the fact that the actual temperature, as represented by degrees Fahrenheit, of the hottest retorts and furnaces, is much lower than the temperature given in the various text books on gas making.

Discussion.

The President—It is a matter of regret that Mr. Jones is not with us to-day, so that he could be here to read the paper himself; but we are just as grateful to him for the paper, which is now before you for discussion.

Mr. Prichard—By looking through the instrument which accompanied Mr. Jones' paper at a gas flame and at an incandescent light, you will be surprised to see what a difference you can notice in the temperature. I have also used it in testing the difference between the temperatures of different retorts.

Mr. Stiness—Did you find a difference between two retorts of the same bench?

Mr. Prichard—I could tell that there was a difference, but I had no standard by which to determine what difference there was. In the letter which I have from Mr. Jones he says: "I am continuing my experiments with the temperature of retorts under various conditions, and am getting some very interesting results."

Mr. Nettleton—I would like to ask how the fusing point of these alloys is determined. I think Mr. Jones states that it was done by an air thermometer.

Mr. Prichard—I infer from the letters which he wrote me that he got his alloys from Germany, where they were prepared by scientists especially for tests of this kind.

Mr. Nettleton—Is there any thermometer which will record as high as 3,000 degrees?

Mr. Prichard—I presume they have some means of determining the temperature, as the melting point of platinum is given as 3,027 degrees.

Mr. Greenough—This paper by Mr. Jones is a very interesting one, and I am sorry that he is not here in person that he might answer the various questions we would all like to put to him on the subject. The first paper that I had the pleasure of reading to this Association (some 16 years ago) was on the question of determining the temperature of retorts. At that time I went through a very long series of experiments, which these gentlemen, who are going to index the proceedings of the Association, will find published in the AMERICAN GAS LIGHT JOURNAL* many years ago. The experiments which I made at that time were made by putting pieces of iron of given weight into the retort, dropping the iron, when hot, into water of a given weight, noting the rising temperature of the water, and from that estimating the temperature of the retort. These experiments have been repeated from time to time, from that time to the present, in the works of the Boston Gas Company. I fancy that those irons are still at the Commercial Point works to-day. Mr. Jones says that the temperatures which he finds are lower than the temperatures at which he has been accustomed to estimate retorts. I should have said that the middle retort of a regenerative bench, with the coal out of it, ought to show a higher temperature than 1,860°, and certainly did show a higher temperature by the tests we made, by the method of ascertaining temperatures which we had. I think it is open to some discussion whether that method is not as accurate as the method of determining temperature by fusing alloys, although the experiments which we made were more or less rough, and were not expected to be any more accurate than within 50° or 100° His paper is a very interesting one; and there are times when a ready method of ascertaining the temperature of retorts is a matter of value, and especially in the management of a large gas works. I think the temperatures of our top retorts in the regenerative benches at Commercial Point (and I will be corrected by Mr. Wood if my statement is not correct), were sometimes up as high as 2,250° or 2,300°.

The President—It was the ordinary temperature.

Mr. Greenough—And the lower retorts were about 200° lower, if I remember rightly.

The President—They ranged from 2,000° to 2,200°.

Mr. Greenough—Those were retorts that took a charge of 350 pounds of coal every four hours, and worked it off very clean. These experiments by Mr. Jones might produce the same result if tried with retorts which were as hot as those were; and I should not wish to let the paper pass without expressing the opinion which we formed as the result of our experience, and which is somewhat at variance with the opinion expressed by Mr. Jones; because I am inclined to think that the temperature of these regenerative benches, when run to their capacity, is as high as the figures which we have made in that direction. That is all that I want to say about the matter.

The President—So far as the accuracy of the two methods is concerned, my sympathies would be with Mr. Jones. I would place more reliance on the fusion point of an alloy than I would on the specific heat method obtained by heating a given weight of iron, as there are so many elements that enter into the latter operation that tend to detract from the accuracy of the method. It depends largely upon the skill of the man in getting the iron out quickly and dropping it into water without losing heat, and the metal so used is apt to waste and lose its heat. If we are not very careful to make corrections and weigh it every time, it seems to me that we shall get only approximate results. It struck me that the method by fusion tests was more accurate.

Mr. Greenough—I simply want to call Mr. Wood's attention to this fact: What he says is perfectly true, that there is no absolutely accurate result obtained in the method of testing by heating iron, because the iron does waste, and heat is lost; but we must remember that if the iron does waste, or if heat is lost in handling, it would show a lower temperature, and, therefore, all the heat you got out of that iron certainly belongs to the retort. If the temperature of the retorts as shown by the heated iron test is less than that found by Mr. Jones' test, I should say that heat had been lost in handling the iron, or that the iron had wasted; but if the heat shows larger than in the Jones test, it must be remembered that if the iron lost anything, it worked as against the retort and not as against the test. One or two experiments would not be of very great value; but after you have done that thing for a series of years and have got average results, I think you should place some reliance upon it.

Mr. Prichard—There seems to be quite a discrepancy between the figures given by Mr. Greenough for high temperatures and those given by Mr. Jones in his letter. He says in his letter that the temperature "obtained from the bridge block between the lower retorts in furnaces of the same bench (this was a blinding heat) was only 2,120°." I never saw a hot retort in a bench that anywhere approached what is called a "blinding heat;" and yet the temperature of your retorts were determined as being 2,300°, while Mr. Jones gets a "blinding heat" at only 2,120°. On the question of the accuracy of those standards it seems to me that the melting point of those alloys is as likely to be accurate as the figures which you obtain when you work out your temperatures by taking specific heats. Specific heat is a very unreliable thing to work from, and there is quite as likely to be error in that factor as in the factors which Mr. Jones introduces. He has only one element of uncertainty, while in the method suggested by Mr. Greenough there are quite a number, outside of the specific heat and the waste in carrying back and forth.

Mr. Greenough—Of course you must assume the specific heat. Any other loss would work against the retort.

Mr. McKay—With regard to the air thermometer that is referred to in Mr. Jones' paper, and to which reference has been made in the course of the discussion, I think that probably Mr. Jones refers to a thermometer which consists of a quantity of gas or air inclosed in an absolutely tight vessel; this gas, when subjected to increasing heat, develops an increasing pressure. The volume being absolutely constant, then, by virtue of the known law that heat would expand the gas in a certain ratio, on the absolute scale the temperature is determined. The gas thermometer is the only known thermometer or pyrometer which has ever given entirely accurate results. It is peculiarly well fitted to determine very high temperatures—as high as 3,000° or 4,000° theoretically. But in the practical manipulation of this thermometer there are many difficulties; and one of the last inventions of Regnault consisted of a metallic or porcelain flask, entirely closed except for a small aperture in the lid, and in that flask there was put a small quantity of mercury, then the whole apparatus was placed in a furnace the heat of which was to be determined. When it had obtained the heat of the furnace it was removed and quickly cooled. Then the mercury remaining in the vessel was weighed. That gave as elements the weight of the mercury, the volume of the flask, and the density of the mercury vapor, because the excess of vapors and air had been expelled while the apparatus was being heated, and from these elements the temperature could be very accurately determined. When I say "very accurately," I mean probably within 25° or 50°, at a very high temperature. It is with such an instrument as that, or with some other form of air thermometer, that the fusing points of these alloys have been determined. In the porcelain manufactories at Sevres, France, they use a system of alloys consisting of quartz, marble and clay, which

*See JOURNAL, issues of March 16, 1877 (p. 102), and April 16, 1877, p. 146.

have been gauged about 50° apart, and with which they secure the marvelous results in baking china which they have made. There has recently been given to engineers, by a Frenchman, an invention consisting of a sight-tube, with a piece of quartz between two Nicol prisms. By revolving the prisms suitably, the middle rays of the spectrum are eliminated in looking at a furnace just in the way that Mr. Jones has described in his paper of looking directly through glass. In looking directly through these three pieces of glass, they are revolved at a suitable angle, which is measured on a micrometer at the head of the tube, the middle rays of the spectrum are eliminated, and those rays falling on the eye are such that one furnace can be compared with another with much more satisfactory results than if nothing is interposed between the eye and the incandescent body. Then, this apparatus being compared as before with an air thermometer, a known graduation on the tube means a known temperature. All that it is necessary to do is to look through the tube and revolve the prisms until you have thrown out the yellow rays, then read the angle, refer that angle to the scale, and you have approximately the temperature of the furnace. But this, too, is compared originally with an air thermometer, as all such apparatuses must be in order to be approximately correct.

Mr. Prichard—Mr. Jones, in closing his letter, says: "You need not return anything to me excepting the little blue glass photo-pyrometer. Either keep the rest yourself, or give it to some one who shows some interest in the paper and wants to try the alloys. I have sent enough of each for seven or eight tests." If any gentleman would like to take these and go through the tests, and give us the results next year, we would be pleased to have him do so.

The President—Mr. McKay seems to have been pursuing a parallel line of investigation to that of Mr. Jones, and I would suggest that he would be a very good man indeed to turn these over to. That can be done without a vote, if no one objects. Before we close the discussion, I would like to have Mr. Greenough allow the possibility that, if Mr. Jones had come on and tried the alloys in our retorts, he might have found a higher heat than even the 2,200° that Mr. Greenough used to discover with his iron tests.

Mr. Greenough—I will "allow" anything. I will allow this apparatus may be a great deal more accurate than ours. I do not know that it is not. I simply wanted to call attention to the fact that we have done a good deal of experimenting in that line first and last, with somewhat different results. I think the President's suggestion that Mr. McKay should make some experiments with these alloys is very well put; and I would propose in connection with it that Mr. McKay try some experiments with regard to the use of the iron processes, and see if there is anything to be said in favor of or against it, and whether the tests with the alloys really give very different figures. The iron test was the best that we then knew. If something better has now come along I shall be delighted to adopt it. The test by heated iron was no invention of mine and I have no special regard for it.

Mr. Stiness—I move that a vote of thanks be sent by the Secretary to Mr. Jones for his very able paper, and that the Secretary express to him our kindly feelings for his remembrance of our Association. (Carried.)

The President—The next paper is by Mr. C. D. Sherman, of New Haven, Conn., on

THE REMOVAL OF CARBON FROM RETORTS WITHOUT THE USE OF THE STEAM JET.

Owing to the greater care in supporting and adjusting the hydraulic main and dip pipes, and the almost universal use of the exhauster, the question of the carbon in the retorts is not so prominent as it was two decades ago. At that time numerous patents were taken out for doing away with the dip seal pressure. The universal custom at that time was to support the main on the piers of the arches above the bench. Of course there was constant expansion and contraction of this brickwork, and under such conditions it was impossible to have a level main. A difference of level of 3 inches was not uncommon in a stack of benches. Then, again, no attention was paid to the adjustment of the dip pipes. They were put in just as they came from the foundry, and often varied 1 inch in length. With these dip pipes working in 4 inches of pitch, is it any wonder the gas engineer of those days was looking with favor on any process that offered him relief? You are all aware of the changed conditions of working to day. Now the main is supported on iron beams, independent of the brickwork, the dip-pipes are of uniform length, and the liquid in the main is limpid. Working under such conditions there is little to be gained by dispensing with the dip-seal, while the formation of carbon in the retorts has been greatly reduced. Still the carbon accumulates to some extent. It comes on so gradually that almost before we know it our retort capacity is reduced from 10 to 20 per cent., with the consequent loss of labor, fuel and repairs. As the latter items in most places cost fully $10 per day, for a bench of 6's, it is easy to estimate the loss of running a bench of retorts whose capacity is reduced one fifth by accumulation of carbon. The process in almost universal use at the present time for the removal of carbon is known as the "Edge Process," and invented by the late G. W. Edge, of Jersey City. Where you can have dry steam this is a very effective process, but it is not always possible or convenient to get dry steam. In our works the steam comes some distance into the retort house, and we are annoyed and delayed by the retorts becoming black in the process of decarbonizing and requiring to be reheated before the process is completed. It was to obviate this difficulty that we recently discarded the steam jet and have adopted an air compresser, which forces a jet of air into our retorts through the same pipes and fittings that we used with the steam process.

We find we can do the work quicker and with less damage to the retort than we could with the steam jet. The air compresser is worked at the same pressure that we introduced steam into the retorts, viz., 40 lbs. This current of air soon burns a passage through the carbon and the remaining portion is easily removed by bars. It is not claimed that there is any novelty in this method. It was in use at the Imperial gas works, in London, 50 years ago, under the management of Mr. Kirkham. Where a company is in a position to use an air compressor I am sure they will find it to their advantage to remove carbon by its aid. The air compressor can advantageously be used where liquid fuels, such as tar and Lima oil, are being used in the furnaces.

Discussion.

Mr. Anderson—I would like to ask Mr. Sherman how long it takes to remove the carbon when it has reduced the retort, say, from 10 to 20 per cent. How long will the air take to remove that amount of carbon?

Mr. C. D. Sherman—This is really an experiment with us. We have been using it only about a month. We find it takes from 15 to 18 hours to remove the carbon from the retort.

Mr. Gifford—I would like to ask Mr. Sherman whether the same pressure can be gotten with a fan blower?

Mr. C. D. Sherman—I do not know how that would be. The air after leaving our compressor passes through a small tank to equalize the pressure, and we have a gauge on this tank which indicates that the air is being compressed to about 40 pounds.

Mr. Bush—In the experiment which I tried the average time of steaming out something over 1,000 retorts, running air in by means of an air jet, was 14 hours and 20 minutes. The average time, however, of steaming out one particular stack in the same way was only about 10 hours. I understood Mr. Sherman to say that his average was about 15 or 18 hours. I would like to ask some gentleman who has noted the different shapes in which a retort is left, after using steam for forcing the air in to remove carbon, or from simply slacking off the lid and acorn on the stand pipe, and burning it out in the old-fashioned way—is there any difference in condition of retorts?

Mr. Anderson—I would like to have Mr. Bush present that question again, as I was not paying close attention.

Mr. Bush—My question was whether the condition of the retort after it is burned out is better, as to the cracks and necessary patching, when steam is used for forcing air in to burn out the carbon, or when the carbon is burned out by simply allowing air to circulate through the retort. I think in some works when the carbon is removed in this way it takes as long as 24 hours to burn the retort out. My question was whether the retort was in better shape, or in worse shape, after being burned out in that way than when used with steam as now.

Mr. C. D. Sherman—When we used the steam jet it often took from 20 to 24 hours. We do not have any system of burning them out. I think it would be better if we burned them out as often as once a month. Our foreman burns them out when he can get a chance, and sometimes it is 6 or 8 weeks between.

Mr. Neal—I have tried both steam and air for retorts. I used the Edge process for a good while, but found that the steam was not dry enough, coming as it did from the boiler to the retort; so I procured a holder and placed it directly in front of the retort, and used that for a while. But we found a great deal better remedy for the trouble than either steam or air, and that is common coarse salt. We have used that for years. It takes just about as long a time to burn out the retort, so that we can remove the carbon with bars, as by using steam. It is an excellent way, and I would recommend it for all.

Mr. Stiness—How about the juice of potatoes? Would not that be beneficial?

Mr. Neal—Perhaps so; but potatoes are getting high. I find that

salt works perfectly well. After a while you will see the carbon separating from the inner surface of the retort; and then, by taking a bar, you can loosen it and draw the carbon out. The most difficult part to remove is the carbon in the rear, where it gathers sometimes to the thickness of 6 inches or more. But we get it all out in this way, and do not injure the retort as where steam is employed, or even common air. We find that the carbon is very useful. We put it in our generators, where it makes a very nice fuel gas—better than coke or anthracite coal; but of course we do not go into the business of making carbon for the sake of feeding the generators or making water gas.

Mr. Anderson—I would like to ask Mr. Neal about what quantity of salt he uses per retort; and if after introducing the salt he uses a closed lid again on his retort, or leaves it open.

Mr. Neal—We use 8 quarts, throwing it into the back of the retort; then take all the plugs out of the bridge pipes and open wide the door to the retort.

Mr. Coggshall—I have used the Edge process for about 13 years; but about a year ago I discontinued it, and am now using air. The operation takes from 24 to 36 hours. It depends wholly upon how long the retorts have been in use before they are burned out. Those I have burned out lately have been in use for four months, and it took from 24 to 36 hours; but the retorts are left in very much better shape than when the Edge process was used.

Mr. Greenough—I move that the thanks of the Association be given to Mr. Sherman for his paper. I like to hear our young men read papers on practical subjects of this kind. It is just what we want. (Adopted.)

The President—A year ago we had the promise of a paper from one of our members, but he failed to respond. I think his excuse was that he had not brought the paper with him. I understand that he has it with him to-day, and I call upon Col. Spaulding to read the paper, if he has it with him.

Mr. Spaulding—That is all news to me.

The President—Then I think he must have mislaid it again, for his superintendent told me that he had found the long-lost paper, and asked if we would have it read. I told him we would, most assuredly.

The Secretary then read the following paper on

THE VALUE OF AN ALL ROUND MAN,

by Col. Charles F. Spaulding:

Members of the New England Association of Gas Engineers—Gentlemen: Do the officers of small and medium sized works properly appreciate the value of an all-round man, when they require one who can adapt himself to the various kinds of work necessary—one who knows how works must be managed to suit local conditions and adapt himself to those conditions? Think of the many duties to be performed.

He must keep without fail a sharp eye upon the *coal pile*, and know that the coal used is correctly weighed. He must watch the retort house labor in every detail, especially to see that the lids are promptly closed in charging, to avoid unnecessary loss of gas; to see that the fires are properly taken care of and clinkered well; and that the coke is picked out of the ashes, before wheeling out. To see that the apparatus is properly constructed, watch its operation, to detect errors in its build, and see if the results are as good as can be had; and, if they are not, to devise some plan to better them. To keep all the apparatus about the works in good working order and keep it all clean and neat. To lay mains to the proper grade and line, and keep legible records of their locations. To put in services, as they should be done, with correct grades and the earth well tamped around them to avoid any settling in the future. To set meters in a workmanlike manner, with connections of a size sufficient to give the consumer all the gas he wants. To keep informed of the different appliances made to use gas for fuel, to set stoves correctly, and to intelligently instruct the user how to run them economically. To keep correct records of all materials used, whether in the yard or outside. He must also be able to manage all kinds of men, and to judge correctly of their peculiarities, that he may get in labor the value of the wages which he pays them.

He must keep informed of the results of others as far as he can learn of them, and profit by them. This he best can do by intercourse and exchange of opinion and experience. To be just and upright in all dealings with the consumers, that they may have confidence in him.

There are a great many other things which he is expected to do than these few I have mentioned, all of which must be properly done for a successful business.

Do not think that I have tried to tell you, superintendents, what you ought to do—that you already know; but only to tell in part what is being done by you now.

I have not mentioned the scientific or theoretical part of our work, but the practical, not ignoring the value of a scientific superintendent for large works, where the details of the business must be divided into departments. I have tried to show the need and value of a practical one for small works; one who must of necessity attend personally to *all* details. Do the officers of small works appreciate the value of an all-round man? The ones that do are few.

Some seem to think that results, as shown at the end of 6 to 12 months, when the accounts are made up, if at all favorable, should not be made known to the man who has worked the hardest for them, and to whom the knowledge rightly belongs; for if he knows that the company is doing well does he not feel pleased that he has helped by his efforts to bring about that favorable showing?

Does he not also appreciate favors, however small, if he thinks that they are willingly granted; and is he not always pleased with sincere words of commendation from the officers?

Discussion.

Mr. Anderson—While I fully coincide with the sentiments of that paper as to the value of an all round man, I think, if we could find such an all-round man, we should have him connected with the trolley system and get him around everywhere. I know that such a man would be highly appreciated; but such men are few and far between. There are only a few good ones. I served in the capacity of an all-round man for 17 years, and I know something of what he has to do. Since I have got to be in command of a small works I find the idea seems to prevail among the directors in small companies that the superintendent should be that all-round man. They expect it of him. I have to look after the details very closely, as I did in former years. The way I manage my works is this: I have a foreman of each gang at the retort house, to whom I pay two or three dollars per week more, and I make him responsible for the general supervision about the retort house and coal sheds. I have him attend to the fires, to the lids and to all that sort of detail. I very seldom speak to a man on the floor, and if I have anything to say I say it to the foreman of the gang. My assistant, who is foreman on the street, takes care of that part of it. I make my foreman of the gang of stokers my all-round man in and about the works in the absence of my assistant or myself.

Mr. Gifford—Does Mr. Anderson allow the foreman of the stokers to hire his own men?

Mr. Anderson—No, sir; I do the hiring and discharging.

On motion of Mr. Anderson, a vote of thanks was given to Col. Spaulding for his paper.

Inviting Mr. Taber to Speak on the Matters Outlined in Mr. Allyn's Paper.

The President—I have been endeavoring to make out the list of committees suggested in the report of the committee on President's address; but the more I ponder over the matter the more it seems to me that that committeee should properly be appointed by my successor; and I feel that the President and Secretary of the Association should be ex officio, members of that committee. The report, as read by Mr. Greenough, simply recommends the appointment of a committee, but does not say how the commitee shall be appointed. Unless objection is offered I shall consider that recommendation as meaning that the committee shall be appointed by my successor, and that the President-elect and the Secretary shall constitute two members of the board, leaving it in the hands of Mr. Nettleton to appoint the remaining four members of the committee. Unless objection is expressed to this course, Mr. Nettleton will make the appointment and notify the members by letter. It is a little out of the usual order, perhaps, but as Mr. Taber was not present when we had our discussion on Mr. Allyn's paper, on the "Effects of the Trolley System on Gas and Water Pipes," I will ask him now to speak on that subject.

Mr. Taber—It seems to me in this matter that while there is a good deal to be thought of, there is not much yet that can be definitely stated about it. So far as I have been able to understand the facts of the case, these difficulties have occurred in isolated places, and are evidently due to the difficulty in returning the current under the car from the motor back to the generator at the station. Of course, there must be a proper return provided in every case. If the underground wire, which is put into all the railroads that are now being built, is found to be of a sufficient capacity to return that current, there will be no difficulty. The electric current will always find the line of least resistance, and return at once; but if there is any difficulty in the way, or if there is too great cheapness in the way of building the railroads, or if there has been a tendency to slight the work, then the current will naturally cross over in the direction in which it can go the

easiest, because it is due at the other pole of the generator, and it will always get there as directly as possible. I do not anticipate that the trouble complained of will be very lasting, because as these matters are ventilated the remedy will very quickly follow the disease. It is a little essential for us to remember that the gas companies must not think they own the entire earth; they must allow the other departments of the world to have part in it. At the same time I would not underrate the danger. We, as a gas community, are accustomed to consider that our gas mains are our strongest hold, and perhaps the most reliable of our assets; but, given the condition of salt water, a galvanized pipe, and a current of electricity, I think we shall find a hole in something very soon; for that is just the condition to set up an electric current. I was most interested in one of the specimens shown yesterday, because it was evidently the direct effect of the constant tapping of a spark of electricity upon the main. The evidence of fusion was so plain that I was quite struck with it. That can be easily remedied. Those of us who are in the electric business know that the static electricity from a belt, as it turns over the pulley of the dynamo, will, in process of time, hurt the insulation of the armature. A very simple remedy is found for that by placing near a few points of iron, connected with the ground. It is found that this carries it all off. It is probable that some equally easy remedy can be found for this trouble. I had occasion this morning to ask them at the office how far this danger was known. They told me that since it had occurred here in Boston they had written to 114 different places, or, rather, had received 114 replies from different places where street car systems were in use, to the question, "What effect, if any, has the system had upon gas mains?" We all know that a gas manager would very quickly report anything of that kind, or at least it would be his duty to do so. I think they had but three reports of any trouble in that connection, so that the danger as yet is small.

Mr. Lamson—I suppose the remedy for the danger resulting from running electric currents on wires underground is to get the lighting companies and railroad companies using electricity to put in their systems in a proper way. If the return wire is large enough, and if care is taken to have the wire smooth, and the connections properly and carefully made, the electric current will stick to the wire and go back to the station. But this business being all rather new, the putting in of railroad wire circuits has been hastily, and in many cases very carelessly done; they have left too many imperfect connections and jagged points, consequently the electric current has jumped off the wires and gone to the pipes, which form an easier conductor back to the station. I suppose water pipe will form the best conductor and gas pipe next. As a result, in cities and towns where there are gas and water pipes, some action will be necessary on the part of the Government to make the companies using electricity put in their wires under some more careful conditions.

Mr. Taber—The difficulty originated largely in the fact that they endeavored, first, to carry the current back again through the rail only, and that, with a small amperage, this practically was about all that was necessary. But in the city of Boston, where there is now, as Mr. Atkinson very appropriately put it, more power sent out from the West End Central Station than there is developed all along the line of the Merrimac river, from Concord to the sea, it becomes quite a question how all this power is to be returned to the power station. That it will be done, and that steps are being taken to do that, and to do it safely, you may all rely, because it is essential to the system that it shall be done. It is only a question of how to deal with these larger powers and these larger currents which are now being developed; and it is simply a matter of time to ascertain how we can handle that immense power as we need to.

THE QUESTION BOX.

The Question Box was then opened, with the following result:

Question No. 1. "In mixing gases of different densities, as coal and water gas, is there any shrinkage, or would 2 feet of each make 4 feet of mixed gas?"

The President—That is a simple question in arithmetic, and I think almost any one ought to be able to answer it. Mr. Bush has had some experience in mixing gases of those two kinds, and he can probably tell us whether or not 2 and 2 make 4.

Mr. Bush—I think they would.

Question No. 2. "At what price must gas for power be sold to put gas engines on the same basis of cost for power as the average electric motors?"

Mr. Prichard—Gas at $1 per 1,000, running 10 hours per day for the working days of the year, figures out about $60 for a horse power per year.

Mr. Stiness—And the electric power about $75.

Mr. Prichard—The price for electric motors runs from $25 to $60 for a horse power per year.

Mr. Spaulding—Mr. Stiness does not mean that it costs $75.

Mr. Stiness—No; but we get that for it.

Question No. 3. "Is it advisable to make a special price for a gas to be used in gas engines?"

(Several members answer ("Yes.")

Mr. Stiness—Always.

Mr. Prichard—Why?

Mr. Stiness—So that people will use it. So that we can get a day consumption.

The President—I heard three or four affirmative answers to that question, but only one negative.

Mr. Lamson—I think I will answer in the negative. I do not and never have thought it fair to consumers to charge different prices for the same gas, used for different purposes. It is not right in selling sugar to have one price to the man who uses sugar for his coffee, and another price to the man who uses it to sweeten his tea. Make the price for the same kind of sugar alike to all; unless, perhaps, you might wish to have a wholesale and a retail price. I have no doubt more gas can be sold in this city, or Worcester, or in fact in most any city, by making the price for gas used for heating and cooking less than for the gas used for lighting; but I myself do not think it is fair to the average consumer.

Mr. Stiness—Policy may enter into the question.

Mr. Lamson—The question of policy has nothing whatever to do with it. It is a more strictly just way of doing business to sell gas to one man at the same price you do to another. There should be no difference unless the question of quantity comes in; that may affect the price.

The President—Does not that question come in with the gas engine?

Mr. Lamson—If you sell to one man 1,000 feet of gas in three months for use in a gas stove for $1 per thousand, while the man next door to him uses 100,000 feet, and you chare him $1.30 for it, I do not think it is fair or just. It may be business, but I could not stand it.

Mr. Richardson—I take exception to Mr. Lamson's idea, for the reason that if a man wants sugar for his coffee and for his tea, he may use it for only one, perhaps; but if by getting it for half price, or at a great discount, he can use it in the two commodities he will do so, and the merchant thereby increases his sales. We have adopted the policy of making different prices for power and mechanical purposes; and I know that if we had not done so we would have lost a large consumption during the day, and would not have been enjoying the moderately large consumption which we now have (for our output of less than 25 million feet) during day hours. We frequently have requests, even during the winter season, for special prices, with the promises of large consumption, if a rebate can be made for gas stoves.

The President—That completes the questions. Is there any miscellaneous business which any member has to bring before the Association?

The Secretary—I have received the following telegram:

"CHICAGO, Feb. 15, 1893.

"C. F. Prichard, Secretary New England Gas Association, Young's Hotel, Boston: Hearty greetings and best wishes. We hope to see you all here in May. OFFICERS OF WESTERN GAS ASSOCIATION."

VOTES OF THANKS.

Mr. Lamson—I move a vote of thanks be passed by the Association to Mr. Wood, our retiring President, for the pleasant and successful manner in which he has conducted the business of the Association.

Mr. Nettleton (President-elect)—You have heard the resolution of Mr. Lamson, and it gives me a great deal of pleasure to put it. So many as favor it will please rise. (All rose.) Mr. Wood, you have the hearty thanks of the Association for the very courteous manner in which you have conducted the business of this Association.

The President—I thank you for this renewed expression on your part of your appreciation of my humble efforts. But I really can take very little credit to myself for the success of this meeting. If it had not been for your co-operation, and for the assistance of the staunch Board of Directors whom I have had working with me, the meeting would hardly have been the success it has been; and, over and above all the rest, I wish to express my personal gratitude to our Secretary. He has been indefatigable in his labors, and has stood by me most loyally; and I thank him for it. When we lost the services, in the office of Secretary, of Charles the First, we feared the Association might go to pieces; but I think we have found a worthy successor in Charles the Second. (Applause.)

Mr. F. C. Sherman—I move that the thanks of the Association be tendered to our Secretary for the very able manner in which he has attended to his duties. Those who have occupied that position well know the many little details and vexations of the office. Our Secretary has been faithful in every respect, and he certainly deserves our thanks.

The President—It gives me great pleasure to put this motion, as my remarks indicated. Those in favor of the motion will please rise. (All rose.) Mr. Secretary, you have the thanks of the Association for your faithful discharge of the duties of your office.

On motion, the meeting was declared adjourned.

Minutes to the Memory of Deceased Members, 1892.

The following reports from the special committees appointed to prepare minutes respecting the names on the mortuary roll of the Association for the past year have been handed in:

GEORGE A. McILHENNY.

This Association has learned with sorrow of the death of one of its honorary members, George A. McIlhenny, and while so much has been said of his many good qualities, it is but fitting that some record be made by this Association of one who stood out so prominently in his profession, and was so much loved by all who knew him.

Able, conscientious and painstaking in his work, he gained for himself an enviable reputation as a gas engineer, and at the same time, by his genial manner, his warm heart and his kindly feelings for all who were brought in contact with him, he formed in the hearts of many a strong friendship towards himself, the memory of which will always be a pleasure.

In his death it can be truly said that the gas industry has lost one of its brightest members, many of us a warm personal friend, and our Association one whose name added luster to its roll.

In behalf of the Association,

Charles H. Nettleton,
Samuel G. Stiness,
George B. Neal,
} Committee.

AUSTIN M. COPP.

Mr. Austin M. Copp, a member of the New England Association of Gas Engineers since February 18th, 1885, died at his residence, in Malden, Mass., November 1st, 1892. He was born in Saugus, Essex county, Mass., July 7th, 1842.

Mr. Copp was prominently identified with the gas business for many years. He was Treasurer and Manager of the Plymouth (Mass.) Gas Light Company; also, of the Exeter (N. H.) Gas Light Company. He was a member of the Board of Directors of the Malden and Melrose (Mass.) Gas Light Company; also, of the Citizens Gas Light Company, of Quincy, Mass., and had served as Treasurer and Manager of the Rockland and Thomaston (Me.) Gas Light Company. He was elected a member of the American Gas Light Association in 1883. In all these positions of trust and responsibility he performed his duties with credit to himself and to the entire satisfaction of the companies which he represented.

His genial presence was always welcomed by his associates, whether of the companies he was associated with or in the Association of which he was a member.

The New England Association of Gas Engineers desires to honor his memory by placing upon its records these minutes, and also to send a copy of the same to his family.

A. B. Slater,
For the Committee.

F. H. ODIORNE.

Mr. F. H. Odiorne died at his residence, in Malden, Mass., on the 3d day of January last. He was born at the same place, on the 26th day of April, 1830.

Although not a member of this Association, his long and intimate connection with the gas interest and kindred industries deserves honorable mention upon our records.

He was President of the Gloucester (Mass.) Gas Light Company; also of the Plymouth (Mass.) Gas Light Company. He was a member of the Board of Directors of the Brookline (Mass.) Gas Light Company; also of the Citizens Gas Light Company, of Quincy, Mass., and had served as President of the Rockland (Me.) Gas Light Company.

He was elected a member of the American Gas Light Association in 1875, and was also an associate member of the Guild of Gas Managers of New England.

Mr. Odiorne was a man of mind, at once comprehensive and with a quick appreciation of details. His judgment was sound, positive and far-reaching. The law of cause and effect was natural to his mind, and his perceptive faculties were keen and active.

In his business relations his sound judgment, advice and wise counsel were always sought and valued by his associates.

The New England Association of Gas Engineers regards it as eminently proper and fitting that these minutes be placed upon its records; and that a copy of the same be sent to his family.

(Signed) A. B. Slater, for the Committee.

EDGAR H. WOODMAN.

In recognition of the death of Hon. Edgar H. Woodman, late Treasurer of the Concord (N. H.) Gas Light Company, which occurred in March, 1892, it is

Resolved. That we accept this decree of Providence with feelings of sincere sorrow. Our associate, who was but for a brief period connected with the gas interests and in membership of this organization, occupied a high position in the social, educational and business relations of the community in which he moved, and commanded therein universal respect and esteem. He was called from life suddenly and with his work unfinished, in the height of his activity and usefulness. Had he been spared to us he would have been an accomplished and earnest worker in the advancement of our fraternal interests.

John M. Hill,
Fred. W. Norton,
W. H. Hayden,
} Committee.

Crude Carbolic Acid.

The *Journal of Gas Lighting* remarks that the fear of an epidemic of cholera during the approaching summer has already begun to quicken the demand for carbolic acid and other tar products in use for disinfecting purposes. Much of the crude carbolic acid is comparatively valueless as a disinfectant; and in this respect the product of the distillation of brown coal is notably inferior to that from black coal. On the Continent, however, discrimination is seldom made between the two; and the less valuable article is sold, to the detriment of the price of the acid from English gas works, where black coal is used. In two long articles in the *Chemiker Zeitung* for January 28 and February 1, Drs. Stockmeier and Thurnauer call attention to the inaccuracy of the ordinary methods of estimating phenol in the crude tar oils, and give some notion of the value of the latter for disinfecting. The method of shaking with soda lye, and estimating the carbolic acid by the amount of oil unattacked, which is that recommended by the German Pharmacopœia, and generally adopted by the dealers, is condemned; and Toth's method of titration with bromine is regarded as decidedly preferable. A modification of the latter, to render it more rapid of execution, is proposed, and the results of determinations by the three systems compared, whereby it appears that Toth's method and the suggested modification give almost identical values—very much, however, below those guaranteed by the dealers who use the method of the pharmacopœia. But Toth assumes that the crude acids do not contain homologues of phenol; and consequently his results are erroneous, and doubly misleading, since Endemann has shown that these homologues have a higher disinfecting power than phenol itself.

To ascertain the exact amount and nature of the phenols present in crude carbolic acids, the former were separated and fractionated; the results being checked by subsequent formation of the tri-brom derivatives, and estimation of the bromine therein. By this means the phenols from three samples of crude acid were found to be almost wholly meta and para-cresol; another sample contained one-fifth of higher homologues, and a fifth sample had a still larger proportion of high phenols. Toth's method gave in all cases lower values; but the method of the pharmacopœia, higher than the actual amounts. It is therefore concluded that, where accuracy is desired, there is no rapid method of estimation known at present, but that the lengthy process of fractionation must be resorted to. The so-called "60 per cent." carbolic acid contained about 49 per cent. of phenols, and the "100 per cent." only 86 per cent.

The disinfecting value of the crude acids is then considered, an aqueous and a soap-solution extract being made for the determination. From the examples examined, an extract containing 5 per cent. of carbolic acid should in each case have been obtained; but even when allowance was made for the deficiency in the carbolic contents of the crude acids, the extracts were in all cases but one very far from the theoretical strength. The one exception was the soap-solution extract of a

so-called 100 per cent. crude acid, which contained 4.25 per cent. instead of a theoretical 4.30 per cent. of carbolic oil. The other crude acids examined gave extracts with an average percentage of about 1.5 of carbolic oils. One sample only was, therefore, in reality, of value for disinfecting purposes; the sole right of the others to the name of disinfectants being their smell of carbolic acid, which might tend to a quieting effect in time of panic. Solutions of exact strength should alone be used; and the crude carbolic acids of commerce vary too much in character and composition to be of direct value. They, however, often contain considerable quantities of valuable disinfectants, such as cresols, etc.; and these should be recovered and made up to solutions of exact strength, whereby their disinfecting power could be readily ascertained.

[Concluded from page 225, issue of February 20th, 1893.]

The Present Status of Natural Gas in Ohio.

[The third and last of a series of articles prepared by PROF. EDWARD ORTON for the *American Manufacturer*.]

The Trenton Limestone as a Source of Gas.—We reach, at length, the great gas field of the State, the only one, in fact, that is thought of when Ohio gas is mentioned. Its early history has been told so many times that it is not necessary to repeat it here. Suffice it to say that in November, 1884, a gas vein was struck at a depth of 1,100 feet below the surface, and with a rock pressure of 450 pounds to the square inch, at Findlay; that in a little more than a year from this date there had been brought to light the existence of a great gas field, with wells equal in production to the great wells of Western Pennsylvania, and an oil field that was already proved to extend through parts of at least four counties. By an examination of the record and the drillings of the first Findlay well, I was enabled to determine that the rock from which the gas was derived was the Trenton limestone of Lower Silurian age. The name was caught up at once and forthwith it became a household word in half a dozen States, and multitudes of people now use the term who doubtless suppose that they always knew that the Trenton limestone was a great source of oil and gas. But, in point of fact, this identification of the Findlay gas rock with the Trenton limestone was the greatest surprise to the intelligent oil producers of the country that their business had ever brought them, and to the geologist the discovery was almost equally unexpected and surprising. All the oil rocks and gas rocks previously known are sandstones, but the Findlay gas rock is a magnesian limestone of exceptional purity. Again, no rock of an earlier age than the Devonian had heretofore been found productive in petroleum or its derivatives, but the horizon of the new rock is near the bottom of the Lower Silurian division.

Of the development of the industries that followed the discovery of Findlay gas, and of the speculative excitement that accompanied, it is not necessary to attempt any extended account. In the course of four years from the discovery of the new gas-field, Findlay had become one of the important centers of gas manufacture in the country.

In the several glass houses that had been established here, 124 glass pots were in use. Eight machine shops and foundries, 7 boiler shops, 15 planing mills, 3 brick yards, 4 limekilns, 7 stone quarries, 1 clay working factory and a number of other industries were introduced into the town, most of them on the promise of practically free fuel. The population of the town expanded in the same time from 6,000 to 18,000 people. All of the population was supplied with fuel at nominal rates. The city was lighted most of this time with torches, the consumption of which was several hundred cubic feet per hour, and for several years the lights were never extinguished. The daily consumption of gas in Findlay during the year 1890 was not less than 30,000,000 cubic feet, of which from 4,000,000 to 5,000,000 was used by the population as domestic fuel, the balance of it going to the glass houses and the other factories above named.

A similar, though less remarkable growth went forward in the other towns that could reach the gas field by wells of their own or by short pipe lines. Among these towns may be named Bowling Green, North Baltimore, Fostoria and Tiffin. In the course of the two years following the discovery of the Findlay field, several subdivisions of the Trenton limestone gas field were brought to light in Northern Ohio. The Findlay gas field was found to extend bodily to the northward and eastward, occupying Allen, Marion and Cass townships of Hancock county, in part, and Bloom, Perry, Henry and other townships of Wood county, also in part. It soon became the fashion, however, to distinguish the Wood county and Findlay fields as separate. They are generally so spoken of to-day, but in reality they are parts of a common reservoir. To the southwestward, however, a distinct gas field was brought to light in Mercer county and which is known as the Mercer gas field. The ground of separation of the Findlay and the Mercer fields is based upon the existence of a trough of oil and salt water in the Trenton limestone between the two fields. They differ in several important particulars, for example, in the depth of the gas rock below sea level, in the original rock pressure which belonged to the gas, in the average and the maximum volumes of the wells which they support, and in their relations to the oil fields. The initial rock pressure of the Findlay field was 450 pounds, while in the Mercer wells the figures did not rise above 350 pounds. The largest wells of the Findlay field reached in one or two cases an outflow of 30,000,000 cubic feet per day, and were probably equal to any wells that have ever been found in the country. The average production of the wells of considerable tracts was not less than 5,000,000 cubic feet a day. On the other hand, the production of the largest wells of the Mercer field did not exceed 10,000,000 cubic feet a day, while the average was less than 2,000,000 feet.

A third gas field, though of small importance, has been developed in Sandusky county, in the neighborhood of Gibsonburg. The gas rock lies deeper here than in the Findlay field, and the rock pressure is consequently higher, but the volume of the wells is small.

Gas has been found at many localities besides these in Northwestern Ohio, during the last five years, but there are no others that really deserve the name of gas fields.

In addition to the reduction of the original gas supply by the various uses already noted, one other great agency in the depletion must be taken account, viz., that of furnishing gas to the villages and cities that were unable to find a supply of their own, and that were nearest to the great fields, for use as household fuel, and in some cases for manufacturers also. The Findlay field, including in this term the gas territory of Hancock and Wood counties, was drawn upon to supply Toledo, Bowling Green, Fostoria, Carey, Upper Sandusky, Tiffin, Fremont, Bellevue, Norwalk and Sandusky, and a score of smaller towns besides. A line was subsequently extended to Detroit, Mich. The Mercer field was called upon to furnish gas to Lima, Van Wert, Celina, Wapakoneta, Greenville, Sidney, Urbana, Piqua, Troy, Dayton and Springfield, and to many villages besides; or, in other words, to every thriving town in the 10 counties nearest the Mercer field.

Under this tremendous draught the gas field has behaved as well as could be expected. During 1887 and 1888 the pressure even in the Findlay field fell but slowly; but in 1889 a marked decline set in throughout both fields, the import of which could not be misunderstood except by a stupidity that *could* not, or an obstinacy that *would* not learn. The decline has gone on steadily, and in some portions of the gas territory even rapidly, to the present time. As the pressure declined the gas came to be overrun by oil and salt water so seriously that it was no longer practicable to supply pipe lines from it, but this difficulty has been overcome to a considerable extent by the introduction of "separators," by means of which dry gas is sent to the lines. Gas pumps also have been attached to every important line, or are now being attached, but the office of the latter is not to lengthen the life of the gas field, but rather to shorten the agonies of its dissolution.

Recently factories of all sorts have been shut off from most of the lines, for the sake of maintaining a fuel supply for domestic consumption. This has been done even in Findlay. The only way in which Findlay can get her share of the gas is to burn it up as fast as possible. If she can make her factories pay for it, the better for her. The discomfort and even the suffering, in some cases, of many of the towns above named, during the last 30 days, it would be difficult to exaggerate. The distress has been in proportion to their dependence on gas as fuel, which in many instances was universal and absolute. There have been differences in the behavior of the different fields and different lines, but almost every one has failed to furnish anything like an adequate supply of fuel to its patrons. This is, in reality, the first winter since gas has been largely introduced in Northwestern Ohio in which anything like a fair test of the supply has been possible. The preceding winters, for several seasons, have been exceptionally mild, and the cold waves have all been of short duration, while at the same time the pressure of the gas had not been reduced to the figures which now obtain.

All Northwestern Ohio now understands that the end of the gas supply is near at hand. Summer fuel may be supplied for household use for several years, it is to be hoped, but not a town will venture to enter upon another winter without some efficient means for reinforcing its gas supply.

The history of the splendid gas fields of Northwestern Ohio is a melancholy, and in some sense a disgraceful one. As stated at the outset of this paper, it is a reproach to our intelligence that this precious stock of fuel, which might have been so managed as to diffuse unspeakable

comfort through the homes of one fourth of the State for at least one generation, has been by barbaric waste or inexcusable misapplication utterly destroyed in less than eight years.

Towards the close of 1889 I gave public utterance on two occasions to estimates of the probable duration of the gas fields of Northern Ohio. The estimates were based on the facts that had been accumulated up to that time. In one statement I expressed the opinion that the number of years that the gas would last, on the scale of use then in force, could be covered by a number written with one digit; in the other I put the limit of large use at five to eight years. I am sorry to find that even the shorter estimate was too long. It does not seem probable, at the present time, that a single natural gas line will be in effective operation by the winter of 1894. Certainly there will never again be a resumption of the large and lavish use that was in force in 1889. The life of the gas fields, on that scale, terminated in 1892.

The opinions or estimates referred to above gave offense in certain quarters of the gas field, and were sometimes ridiculed as of no weight, and again, denounced as opposed to the public interest. There were certain "learned Thebans" abroad who were never weary of demonstrating that the gas supply was perennial, and that there was no more danger of exhausting a gas field by drilling than there is of exhausting the water supply of a region by wells and pumps. "When the blind lead the blind," we know what result to look for. There are cases in Northern Ohio where the leaders and the led have not only fallen themselves into the ditch, but have dragged down and buried with them large amounts of public money. The ditch into which one town has fallen is over 30 miles long, and over $1,100,000 of the public money lies permanently invested in it. For some time past, these oracles have been dumb, but let us hope that the strings of their tongues will be again loosed and that the experience of the gas fields of Northern Ohio during the past year will be brought into harmony with the doctrine of a perennial gas supply as opposed to the doctrine that gas is stored in porous rocks under hydrostatic pressure. The expounders of science would be sure of a more intelligent audience than they had before, for their audience has, in the interval, been at a school where the tuition is high, but where the lessons are thoroughly learned. Let us hear once more about the internal heat of the earth and the chemical origin of the bitumens and the beneficent work of nature in keeping the gas fountains forever flowing.

An Investigation of Coals for Making Coke in the Semet-Solvay Ovens, with the Recovery of Ammonia and Tar; and Remarks on the Sources of Ammonia.

[A paper read by Mr. J. D. Pennock, Syracuse, N. Y., before the February meeting of the Am. Inst. of Mining Engineers.]

About a year and a half ago Mr. Morris, an engineer of the Solvay Process Company, was sent to Belgium and France to study the manufacture of coke in the Semet-Solvay ovens, which were in operation at Havre.

With complete plans of construction and a good understanding of the methods of running the ovens, he returned to Syracuse. Work on 12 Semet-Solvay ovens was immediately begun. These ovens, with plant for crushing and washing coal, and the necessary condensers, scrubbers, and concentrator for the recovery of the bye products are nearly finished, and will soon be in operation.

As the work approached completion it became necessary to determine what coal should be used. Accordingly, a chemical investigation of the various bituminous coals was made.

I. Investigation of Coals.

The samples of coal taken for analysis were: I. A sample of Reynoldsville coal that had been exposed to the weather for a year; II. Reynoldsville coal taken from a car direct from the mine; III. Morris Run lump coal; IV. Morris Run fine coal; V. Coal from the Fairmount Coal and Coke Company; VI. A special engine coal from Pardee colliery, Phillipsburg, Pa.; VII. South Fork, Pa., coal; VIII. Coal from Laceyville, Ills.; IX. Pittsburgh bituminous coal from Ocean mines (gas coal); X. Steubenville, O., coal; XI. Evansville, Ind., coal; XII. Coal from the Ohio Coal Company.

Proximate Analysis.

	I.	II.	III.	IV.	V.	VI.
Water at 90° C.*	.....	.....	.....	.....	.....	.....
Volatile.....	31.14	33.00	17.73	18.12	37.20	23.86
Fixed carbon..	64.49	58.07	71.92	71.89	56.68	73.00
Ash.....	4 37	8.93	10.35	9.99	6.12	3.14
Coke.....	68.86	67.00	82.27	81.88	61.88	76.80

* Dried before analysis.

	VII.	VIII.	IX.	X.	XI.	XII.
Water at 90° C..	.....	12.20	.28	.88	6.73	1.64
Volatile.....	15.51	41.60	39.09	40.44	38.48	42.275
Fixed carbon..	78.60	41.15	57.33	56.60	43.74	45.92
Ash.....	5.84	5.04	3.30	2.07	11.04	10.16
Coke.....	84.14	46.19	60 63	58.67	54 78	56.08

I., II., III. and IV. all produced a very good coke. VII., on account of low volatile matter, produced a soft coke. The others produced hard cokes, but swelled, some more than others. If all these coals were available at the same price and would make coke of equal quality, then the choice would be of that coal which would yield the most coke per ton of coal. III. and IV. produced a coke in the laboratory equal to any of the others, and, per hundred of coal, produced more coke; and hence these two coals, on the score of yield of coke, should be chosen.

Impurities in the Coal and Coke.—Referring to the analysis, it will be seen that III. and IV. are highest in ash, with one exception—XI. But even with this greater amount of ash, there is still a greater amount of carbon in the coke of III. and IV. than in any of the others, except VI. and VII. The coals from Illinois, Indiana and Ohio must be withdrawn from the competition on account of their great distance from Syracuse and their very low yield in coke.

Sulphur in the Coals and in the Coke Made from them.—The manufacturer of coke for general metallurgical purposes must well consider the amount of sulphur in the coal used. In coke made from each of the above samples the sulphur was determined in check analyses. The following is the result in comparison with the original sulphur in the coal:

	I.	II.	III.	IV.	V.	VI.
Sulphur in coal..	1 21	2.18	.584	.83	2.23	.59
	1.12	2.16	.567	.82	2.18	.58
Sulphur in coke	1.07	1.91	.58	.73	2.04	.55

	VII.	VIII.	IX.	X.	XI.	XII.
Sulphur in coal.....	1.38	2.45	.72	.83	1.66	2.32
Sulphur in coke.....	1.22	2.25	.68	.77	1.64	2.25

The coke manufacturer would not hesitate long in making a choice as regards sulphur, supposing the cokes were equal in other respects. Throwing out VI., from which a good coke cannot be made, then III., IV., and IX. are the best as regards sulphur. But IX. is a gas coal, and should not be considered.

Sulphur Present in Bituminous Coal in Three Forms.—Sulphur occurs in coal combined with iron as pyrites, FeS^2, or with carbon as hydrocarbon, or as a fixed sulphate, usually $CaSO^4$.

For the metallurgist, sulphur in the first two forms are specially injurious. But when the coke is to be used in kilns for the burning of limestone, sulphur in all forms is taken up by the lime, and appears principally in the oxidized form—calcium sulphate. Especially costly is the use of lime containing sulphate of calcium in the manufacture of caustic soda from the carbonate of soda. In causticizing a ton of carbonate of soda, lime containing 2 per cent. of sulphate of calcium converts 42 pounds of the 2,240 pounds of carbonate of soda into the less valuable product, sulphate of soda.

In determining the percentage of sulphur present as iron sulphide, I used Dr. Drown's method, with the following result:

Coal.	Sulphur as FeS^2 Per Cent.
I. contained.....	0.616
III. "	0.12
VI. "	0.09

It will be seen that the metallic sulphide is present to a great extent in I., while in III. and VI. the greater part of the sulphur is present as an organic sulphide and a fixed sulphate. These analyses are well checked by the analyses of the ash remaining after the carbon of the coal has been burned off.

After fusing with soda in the analysis, and after separating the silica, the acid filtrate, through the intensity of its yellow color, was an excellent indicator of the percentage of iron, and hence of the metallic sulphide originally present in the coal. No. I. gave an intensely yellow color, III. gave only a slightly tinted solution, and VI. was almost colorless.

Analysis of Ash from the Coals.—No analysis of coal is complete without a careful determination of the constituents of the ash. The percentage of iron in an ash may be estimated approximately from the color, though not with certainty, as the reddish color may be due to the presence of some other oxide; for instance, manganese. Much iron in a coal produces ferric silicate, which fuses at a low temperature and forms a slag.

The possible importance, both scientifically and commercially, of the analysis of an ash, is well illustrated by the case of Gillespie vs. Russell, in Edinburgh (1853), the famous controversy over the classification of torbanite as a coal or not a coal.

The ash analyses of the coals under consideration are as follows:

	I. Red.	II. Red.	III. Gray.	IV. Gray.	V. Red.	VI. Gray.
Silica. ...	41.48	40.32	60.95	56.31	33.92	44.28
Al^2O^3.....	34.68	39.02	35.34	34.80	34 22	45.20
Fe^2O^3.....	18.75	17.81	1.78	6.56	30.62	1.23
CaO.....	4.38	2.65	1.55	2.83	1.48	5.14
MgO.... .	.12	.07	.04	.05	.11	.101
SO^3.....	.42	.46	.28	.37	.51	.78
	VII. Red.	VIII. Dark Red.	IX. Yellow.	X. Light Yellow.	XI. Gray.	XII. Reddish Yellow.
Silica.....	43.95	28 43	50.45	45.15	51.37	29.48
Al^2O^3.....	39.54	16.94	38.09	43.96	22.79	22.90
Fe^2O^3.....	15 00	38.52	7 37	2.70	10.72	45.56
CaO.....	1 54	11.22	3 02	3.72	10.67	1.35
MgO.....	trace.	....	....	....	....	....
SO^3.....	.26	.379	2.25	4.33	2.48	1.73

VIII. and XII. were highly charged with pyrites, while VII. and XI. contained layers of gypsum.

[To be concluded.]

Lamination in Metal.

Prof. John Tyndall contributes something new upon the subject of cleavage, as it occurs in crystals, rocks, ice and other bodies; and his studies lead inevitably to the conclusion thet lamination results from the operation of the same laws under analogous conditions as those which produce the property known in mineralogy and crystallography as cleavage.

At first, one would suppose wax, or baker's dough, to be most unlikey substances wherein to detect any tendency to cleavage; yet it is precisely with these materials, wherein plasticity is a most prominent phys ical property, that Prof. Tyndall has performed experiments that are commanding the attention of the scientific world, and the results of which have an important bearing upon the metallic processes. In these plastic materials and others, such as clay and graphite, Prof. Tyndall has proved that cleavage may be developed in as marked a degree as in slate—even the varieties of the latter used for roofing—by the simple application of pressure to the plastic mass. Cakes of wax that have been thus treated are easily split up into regular laminæ, so uniform in character as to excite the surprise and admiration of those who have witnessed the experiments.

These researches appear to have proved that any material, no matter how plastic or how homogeneous it may appear to be, has within it the condition for the development of cleavage, and that the only external condition necessary to produce lamination is a sufficient degree of pressure exerted in one direction upon the mass. The resulting planes of cleavage will be at right angles with the direction in which the pressure is applied. The philosophy of this effect lies in the fact that, as relates to the cohesion of its particles, no substance is strictly homogeneous; that is to say, the particles, granules or molecules of substances do not possess cohesive power equally in all directions; and hence, when pressure is applied to them, they slide over each other (the sliding surfaces being those of least cohesive power) and move toward a point of less pressure. In the case wherein pressure is applied in one direction only, the sliding will be in a direction at right angles with the direction of the pressure, and thus plates, laminæ or strata are generated in the mass, the limiting faces of these layers having less cohesion than their interior parts.

It is thus that under the action of the rolling pin flaky pie crust is formed. The same kind of stratification is formed in a biscuit, while in bread, the loaves of which are shaped by kneading, this stratification is absent, and a fibrous structure—called by bakers the "pile"—results from the difference in the manipulation. It is entirely indifferent what kind of material is thus operated upon, provided that it will in some de gree yield to pressure without crushing into powder; the result of pressure exerted in one direction more than in any other will result in lamination more or less marked. A practical illustration of this kind of action is found in iron and other metals. When iron undergoes the ordinary process of rolling it is taken at a welding heat from the furnace, and the uniformly distributed heat weakens the cohesive power of the particles quite equally throughout the mass; the result is a fairly homogeneous bar or plate. However, in bars the tendency to longitudinal stratification is manifest, and when the bars are cold and cohesion has again been restored to its normal power, it can always be found that iron so produced is stronger longitudinally than laterally.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. William S. Essick, President of the Keystone Meter Company, of Royersford, Pa., writes us that the Company is looking for a man to represent it in the Eastern States. Communications on the subject may be addressed to Mr. Essick.

The Norwalk (Ohio) Incandescent Electric Light Company has gone into the hands of an assignee. It looks that Superintendent Christian's high candle power gas, together with the selling price thereof, can be held responsible for the Electric Company's sad plight.

A bill, introduced by Mr. Fruit, of Mercer, authorizing natural gas companies to manufacture or purchase and supply artificial gas, is before the Pennsylvania legislature.

An interesting damage case is reported from the Broome county (N. Y.) Circuit Court, sitting at Binghampton, the case being that of Thos. Small against Messrs. Edward Sullivan, John A. Sullivan and Henry P. Clark, in their capacity of proprietors of the Windsor Hotel, Binghampton. Complainant sued for $5,000 damages for the loss of the services of his son, who, on the night of June 16, 1888, lost his life through inhaling gas that poured into his sleeping room through an open burner. The father alleged that the burner or its fixture was imperfect, but the hotel men averred that the fixture and burner were in good order, and that deceased, who was under the influence of liquor on retiring for the night, compassed his own destruction by blowing out instead of shutting off the gas. The testimony supported defendants' contention, and the jury returned a verdict of "no cause for action."

The North Shore Traction Company, of Lynn, Mass., has placed the contract for its new car shed with the Berlin Iron Bridge Company, of East Berlin, Conn. The building, which is to be 103 feet in width and 300 feet in length, will be constructed entirely of iron and brick, in order that the station may be fireproof. The Bridge Company is also constructing an addition to the car sheds of the Wilmington (Del.) City Railway Company.

The gas makers at the coal and water gas stations of the Milwaukee (Wis.) Gas Light Company have asked for an order changing their working hours from 12 to 8 hour shifts. These men have been receiving $2.50 per day for three-fourths of the year (in the June, July and August quarter the pay is $2.75 per day), but are willing to accept a 10 per cent. cut in wages if the Company will only authorize a 33⅓ per cent. cut in the hours of labor. No doubt they would; but the Company naturally fails to see it in a similar light.

The plans of the new buildings for the Brattleboro (Vt.) Gas Light Company are completed.

We regret to have to report the death of Mrs. Daniel Trowbridge, the estimable wife of the President of the New Haven (Conn.) Gas Company.

The Philadelphia (natural) Gas Company has entered suit for $10,000 damages against the Central Traction Company and contractor C. A. Balph, of Pittsburgh, Pa., and against that city, also, charging that in 1889, when the vault under the street in front of what is known as the "Wylie avenue power house" was constructed, the gas main of plaintiff was so carelessly handled that its joints were sprung. The gas that was thus permitted to escape collected, among other places, in the cellar of the premises No. 57 Wylie avenue, where an explosion occurred. Among the sufferers by this explosion were Mrs. Mary Glass and Mrs. Barbara Eckendorver, who subsequently received $8,160 from the Gas Company. The latter asks to be reimbursed. The city is named as a defendant on the ground that some of its employees were concerned in the operations at the time the vault was being constructed.

At the annual meeting of the Annapolis (Md.) Gas and Electric Light Company the following Directors were chosen: W. H. Gorman, Ed. Powers, J. H. Brown, J. W. Randall, G. D. Edout, J. B. Leth, T. Timis, E. S. Riley and J. S. Gittings.

In response to several inquiries we publish the following legislation, enacted by the New York Legislature in May, 1892, which has refer-

ence to "unlawful interference with gas meters and appliances for supplying gas." The number of the chapter is 699, and the intent of the act is to change section 651 of the Penal Code so the same shall thus read:

"A person who wilfully, with intent to injure or defraud, connects a tube, pipe or other instrument or contrivances, with a pipe used for conducting or supplying illuminating gas, fuel or natural gas, in such a manner as to supply such gas to any burner or orifice, where the same can be burned or used without passing through the meter or instrument provided for registering the quantity consumed; or who wilfully, with intent to injure or defraud, obstructs, alters, injures or prevents the action of a meter or other instrument used to measure or register the quantity of illuminating, fuel or natural gas, consumed in a house or apartment, or at an orifice or burner, or by a consumer or other person, or a person other than a State Inspector or deputy inspector of gas meters, or an employee of the company owning any gas meter, who wilfully shall detach or disconnect such meter, or make or report any test of, or examine for the purpose of testing any such meter so detached or disconnected, is guilty of a misdemeanor. A person who wilfully, with intent to injure or defraud either,

"1. In any manner whatever, changes, extends or alters, any service or other pipe or attachment of any kind, connecting or through which natural or artificial gas is furnished from the gas mains or pipes of any person, company, or corporation, without first procuring from said person, company or corporation written permission to make such change, extension or alteration, or

"2. Makes any connection or reconnection with the gas mains or service pipes of any person, company or corporation furnishing to consumers natural or artificial coal gas, or turns on or off, or in any manner interferes with any valve or stop cock or other appliances belonging to such company or corporation, and connected with its service or other pipes or enlarges the orifice of mixers, or uses natural gas for heating purposes except through mixers, without first procuring from such person, company or corporation, a written permit to turn on or off such stop cock or valve, or to make such connections or reconnections, or to enlarge the orifice of mixers, or to use for heating purposes without mixers, or to interfere with the valves, stop cocks, or other appliances of such person, company or corporation, as the case may be, or

"3. Retains possession of, or refuses to deliver any mixer or mixers, or other appliances which may be, or may have been loaned or rented to them by any person, company, or corporation, for the purpose of furnishing gas through the same, or who sells, loans, or in any manner disposes of the same to any person or persons, other than the said person, company or corporation entitled to the possession of the same, or

"4. Sets on fire any gas escaping from wells, broken or leaking mains, pipes, valves or other appliances used by any person, company or corporation, in conveying gas to consumers, or interferes in any manner with the wells, pipes, mains, gate boxes, valves, stop cocks or any other appliances, machinery or property of any person, company or corporation engaged in furnishing gas to consumers, unless employed by or acting under the authority and direction of such person, company or corporation, is guilty of a misdemeanor and punishable by imprisonment for not more than one year, or a fine of not more than $100, or by both such fine and imprisonment."

In the second department of the California Supreme Court, in a case on appeal from the Superior Court for Los Angeles county, Judge McFarland handed down a decision, in the case of V. L. Elbert, respondent, vs. the Los Angeles Gas Light Company. The main points of the decision, which was concurred in by Judges Paterson and De Haven, and which sustains completely the contention of Mr. Elbert's counsel, are as follows: "This is an action to recover damages for the breach by defendant of an alleged contract by which defendant agreed to employ plaintiff as its Superintendent for a term of two years. Judgment went for plaintiff, and defendant appeals. The main points made by appellant may be condensed into the statement that the evidence does not show any contract such as is averred in the complaint, and found by the Court, and that, at least, it does not show a contract in writing within the meaning of the Statute of Frauds. We do not, however, think that the appellant's position is tenable. It appears beyond dispute from the evidence that in November, 1888, certain letters and telegrams passed between C. H. Simpkins, who was then President of the defendant (a corporation), and the respondent, concerning the employment of the latter. At that time Simpkins was in Los Angeles, California, which was the principal place of business of the defendant. Respondent was at Minneapolis, in the State of Minnesota. It appears further beyond doubt that, in pursuance of said correspondence, the respondent left his employment in Minneapolis, came to Los Angeles, entered upon the duties of the office of Superintendent to appellant, performed said duties for more than one year continuously, and received his salary from the defendant in the amount stated in said correspondence. It appears further that, shortly after the expiration of the first year, the appellant, through its then President, W. B. Cline, without cause, discharged said respondent and refused to accept further services, or to pay for the same, the only cause being that appellant desired to go out of business. Now, with regard to the question whether or not the letters and telegrams afford sufficient evidence that a contract for two years, at a certain stipulated price, was made, we deem it enough to say that we think said evidence was sufficient to show facts, and we do not consider it necessary to repeat said letters and telegrams in detail. It is contended, however, by appellant further that said letters and telegrams do not constitute a sufficient contract or memorandum in writing to satisfy the Statute of Frauds. It is settled law, however, that a correspondence through letters or telegrams, or both, if they show clearly what the contract was, is sufficient under the Statute of Frauds. In Breckenridge vs. Crocker, 78 Cal., 534, this Court said: 'In order to take a contract * * * out of the Statute of Frauds, it is not necessary that there be a formal contract, drawn up with technical exactness. A memorandum is sufficient of the agreement, and it may be found in one or more papers; some or all may be telegrams.' In Ryan vs. the United States, 136 U. S., the Court held that 'a complete contract, binding under the Statute of Frauds, may be gathered from letters, writings and telegrams between the parties, relating to a subject matter, and so connected with each other that they may be fairly said to constitute one paper relating to the contract.' We think, also, that it clearly appears that the respondent was employed by the appellant, and not by said Simpkins personally. We do not think that the Court erred in sustaining an objection put to the respondent by which he was asked if he had tried to get employment in a kind of business different from that which he was employed by the appellant * * * The judgment and order denying a new trial are affirmed."

The Peoples Gas Company, of Steelton, Pa., has been incorporated by Messrs. John N. Jiless (Pittsburgh), J. M. M. Cophelin, John McConkey, Ed. L. King, John G. Gilbert and C. B. McConkey, of Harrisburg.

Bill No. 409, introduced in the New Jersey Legislature by Mr. Holmes, authorizes any city in the State to erect and maintain a gas works.

The Troy (N. Y.) Gas Light Company has been awarded the contract for the public lighting of the city on the following terms: Gas for public buildings, $1.50 per 1,000 cubic feet. Street gas lamps, 8 cents per lamp per night. Last year the Company supplied gas to 280 street lamps.

The offices of the Jamaica (L. I.) Gas Light Company have been removed to the rooms heretofore occupied by the Jamaica Club on Fulton street. We also understand that Mr. J. Tyler Watts has been superseded as Superintendent of the Company by a Mr. Baker.

A new steam plant has been added to the works of the Eureka (Cal.) Gas Company.

The consolidation of the gas and electric lighting interests of Somerville and Raritan, N. J., has been arranged.

The contract for the new holder for the Riverside (Cal.) Gas and Electric Light Company has been awarded to the Davis & Farnum Manufacturing Company, of Waltham, Mass.

The proprietors of the Danville (Ky.) Gas Company seem to have awakened at last from their lethargy, this belief springing from the fact that the Board of Directors have ordered a reduction in the gas rate to $2.50 per 1,000 cubic feet, from $3. The Company also agrees to furnish gas fixtures at manufacturers' net rates, and expresses a willingness to pipe houses at the cost of the work. The new rate goes into effect on April 1st, and the Directors promise to order a subsequent cut "as soon as the consumption justifies it."

Superintendent J. S. Brown, of the Danville Company, who is our informant in respect of the rate reduction, also intimates that the plant will be enlarged. A bench of 5's will be added to the carbonizing division, and the purifying system will be increased.

A notice to this effect was published in the Fishkill (N. Y.) *Daily Journal* of the 3d inst.: "There will be no prayer meeting at the Presbyterian church to-night, on account of no gas."

The franchise of the Lansing (Mich.) Gas Company has been extended for a term of years, one condition of the renewal being the payment to the city by the Company of a sum equal to 5 per cent. per annum on the gross receipts.

Mr. W. R. Addicks, of the Boston (Mass.) Gas Company, recently delivered a lecture on "Gas Lighting," before the Harvard Improvement Association, of Dorchester.

The case of the Norwalk (Conn.) Gas Light Company against the borough of Norwalk, under which plaintiff sought to recover for the

loss of 1,000,000 cubic feet of gas, such loss being attributed to fractures in the Company's mains caused by the negligence of contractors engaged in constructing a sewerage system for the city, was decided in favor of defendant.

Mr. John N. Stickney, for many years Treasurer of the Rockville (Conn.) Gas Light Company, died at his home in that city on the 1st inst. He was in his 75th year, and was very prominent in the commercial and social life of Rockville.

The bids submitted by the respective lighting companies of Newark, N. J., for the public lighting of that city for a term of 10 years, are appended—contracts were subsequently executed between the city and the companies virtually on the basis of the reported figures. The offer of the Newark Gas Light Company: "We will enter into a contract with the city of Newark for a supply of gas for a term of 10 years, to take effect April 1, 1893, upon the following terms: The cost of gas to the public buildings to be $1.25 per 1,000 cubic feet. The cost of the public lamps to be $16 per annum, instead of $19 as at present for 3,300 hours' lighting, or $19 per annum for 4,000 hours' lighting. We will supply our private consumers at $1.45 per 1,000 net for the first 5 years and $1.40 per 1,000 net for the second 5 years.* The terms of the contract to provide for the proper protection of our business, substantially as by contract of August 2, 1884, between the city of Newark and the Company." The Citizens Gas Light Company's tender was: "To the city, $16 for street lamps to be lighted 3,300 hours, or $19 for 4,000 hours, and $1.25 net per 1,000 feet in municipal buildings. To private consumers, $1.55. with a rebate of 10 cents per 1,000 during the first 5 years of the term, and $1.50 per 1,000 feet, with a similar rebate during the second 5 years. In other words, the net price shall be $1.45 during the first 5 years and $1.40 during the balance of the proposed term. It is expected that the contract, if awarded, shall contain provisions similar to those of the last contract, for the protection of our business during the new term." The bid of the Newark Electric Light and Power Company was as follows: "We will furnish 600 arc lamps of 2,000-candle power each, including those now in use, to burn every night and all night, on an average of 11 hours per night, or 4,000 hours per year, for 35 cents a light per night. In case the number of lamps is increased at any time during said term of contract to 1,000 lamps, we will reduce the price to 30 cents per lamp per night. In case you increase the number of lamps during this contract to 1,500 lamps or more, we will reduce the price to 27 cents per lamp per night. Our proposition is based on the contract not going into operation until 6 months after its acceptance."

The following comes from a Toronto correspondent: "The annual meeting of the Guelph Gas Company was held a few days ago, with the President (Mr. Guthrie) in the chair. The financial statement for 1892, and the Directors' 22d annual report were read, from which it appeared that a dividend of 2½ per cent. was paid on the 1st of August. and a further dividend of 3 per cent. will be paid on March 1st, making 5½ per cent. for the year. The business of the Company, though fairly satisfactory, was not quite equal to the previous year, owing to the increase in price of gas coal and oil. Gas for summer cooking continues to grow in favor with the public and promises to go on increasing. The loss of street lighting in the gas department has somewhat affected that branch of the business."

The Milwaukee (Wis.) Gas Company has changed hands, largely through the efforts of Messrs. Seligman, of this city. They will now proceed to "finance" it.

The following are the terms of the contract on public lighting account entered into between the authorities of Boston and the Brookline Gas Light Company:

"The Brookline Gas Light Company, a corporation duly established under the laws of the commonwealth of Massachusetts, of the first part, hereafter called the contractor, and the city of Boston, a municipal corporation in said commonwealth, of the second part, hereafter called the city, on this 27th day of February, 1893, agree:

"First—That this agreement, in so far as it relates to the time of furnishing gas, shall take effect on the 2d day of July, current, and continue subject to appropriations until the 2d day of July in the year 1896, and thereafter, until the superintendent of lamps of said city shall, with the written approval of the Mayor, notify the contractor that the contract is terminated.

"Second—The contractor shall furnish all the gas required for lighting the public lamps now located, or which may hereafter be located, in the district known as the city proper; south part, comprising wards 11, 16, 17 and 18; the Roxbury district, comprising wards 19, 21 and 22, and that part of ward 20 lying to the west of a center line of Blue Hill avenue and Hampden street; and the Brighton district, comprising ward 25 of said city, during such hours as said Superintendent shall direct. All gas furnished to be of not less than 25 candle power.

"Third.—The contractor shall furnish and put down all service pipes required for said public lamps, with a regular fall toward the street mains, and keep in regular repair the portions of all service pipes below ground, and use for said new pipes and repairs only wrought iron pipes not less than 1 inch in diameter, and wrought iron or malleable iron couplings, bends and elbows.

"Fourth.—The contractor agrees to set new posts as furnished by the city, for gas and naphtha lighting, to remove posts not in use, and to reset posts to line and grade of street when so ordered by the superintendent of lamps, the work to be done as rapidly as practicable.

"Fifth.—The contractor agrees to furnish and to apply to said lamps automatic regulator burners, each delivering not less than 4 cubic feet of gas per hour, said burners to be the property of the city, and shall, when so requested by said superintendent, change any burner to a burner delivering such amount of gas per hour as said superintendent may direct.

"Sixth.—The contractor agrees to furnish a sufficient quantity of alcohol to keep the supply pipes free from obstruction.

"Seventh.—The contractor agrees to connect by service pipes as aforesaid the street lamps now in use in the city proper, south district and in the Roxbury district, with its lines of mains free of expense to the city.

"Eighth.—The contractor agrees in putting down its pipes and mains not to disturb any asphalt, brick or stone pavements with concrete base, but shall, when such pipes or mains are carried through streets so paved, perform such work, or lay such pipes or mains in such places as shall be assigned by the superintendent of streets in his permit.

"Ninth.—The contractor agrees that, if any portion of the street which it has excavated for the purpose of laying its pipes requires repaving or resurfacing within a period of one year from the time it has been disturbed, it will make such repairs as in the opinion of the superintendent of streets are necessary to put the surface of said street in as good condition as it was before the time of said excavation; provided, that in the opinion of said superinteadent such resurfacing has become necessary by reason of said excavation.

"Tenth.—Such additional pipes as are necessary for the performance of this contract shall be laid by the contractor promptly in such localities and in such manner as the said city, by its proper officers, shall permit and approve, and the contractor shall pay such inspectors appointed by the city as may be, in the opinion of the superintendent of streets, necessary to superintend said work, and the public lamps in the city proper, south district, shall be connected with the pipes and mains of the contractor on or before July 2, 1893, and said lamps in the Roxbury district shall be so connected on or before Sept. 1, 1893.

"Eleventh.—The city agrees monthly to pay to the contractor 70 cents for each 1,000 cubic feet of gas furnished in the city proper, south part and Roxbury districts; and $1.25 for each 1,000 feet of gas furnished in the Brighton district; also, all the reasonable expenses actually incurred for labor and materials in furnishing and putting down the service pipes and in keeping in good repair the portions of said pipes below ground; also one half of the cost actually incurred in removing and cleaning the burners once in each year and changing the size and style of the burners when required so to do by said superintendent; such new burners to be the property of the said city, pro rata deduction from said monthly payment to be made for imperfect service.

"Twelfth.—In consideration of this contract and of said promises of payments on the part of the city, the contractor agrees to and with said city to furnish to said city all the gas required by said city for the purpose of lighting its public buildings, parks, squares, and other public grounds within said city proper, south part and Roxbury districts for the sum of 70 cents a thousand cubic feet, and within the Brighton district for $1.25 per thousand cubic feet, and when requested by the mayor of said city it will make proper and sufficient contracts with the various departments of said city for the further carrying out of this agreement.

"Thirteenth.—In further consideration of this contract and the promises aforesaid, the contractor agrees to and with said city to furnish to all private consumers within said city proper, south part and Roxbury districts, gas at a price not exceeding $1 per thousand cubic feet, and within the Brighton district to furnish gas to all private consumers at a price not exceeding $1.50 per thousand cubic feet, all of said gas to be of at least 25-candle power. Said prices are not to be increased so long as this contract with the city shall continue in force, and this clause shall be printed upon all bills rendered to said private consumers by the contractor during the term of this contract; and any court sitting in equity can enforce the specific performance of this clause of this contract on the application of either the city, any citizen of Boston, or any private consumer in said district.

"Fourteenth.—The contractor shall pay to the city on the 2d day of August of each year during the continuance of this contract a sum equivalent to one half of its net earnings during the year ending on the 30th day of June preceding, as shown on the books of the contractor, which are to be kept in accordance with law, after paying an annual profit of 8 per cent. on the actual money invested in that year in its gas plant, which amount at present is taken to be $1,000,000, provided the said profits shall be reckoned as cumulative from the date hereof.

"In witness whereof the contractor has hereto subscribed these presents by Robert Amory, its President, and Harcourt Amory, its Treasurer, thereto duly authorized, and has affixed its corporate seal, and the city, by the superintendent of lamps, has hereto subscribed these presents."

* The contract finally signed provides that the net rate to ordinary consumers shall be $1.40 per 1,000 over the entire term of 10 years.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

MONDAY, MARCH 13, 1893.

The Market for Gas Securities.

The market for city gas shares was very dull during the week, Consolidated experiencing a sharp decline. The opening price to-day (Friday) was 124½ to 125½, and the weakness is likely attributable to the fears of small holders, who view with suspicion the gas rate propositions at Albany. We do not think the $1 gas bill will become a law this year; and further it is more than likely that in the next five years the Company will have developed plans that will enable it to manufacture gas more advantageously. Equitable is strong and Mutual easily holds its own.

Brooklyn shares were notable for the strength displayed by Nassau and Williamsburg and for a sharp drop in Brooklyn. The situation there in respect of consolidation shows no marked change, although the lines are tightening all the while, and we imagine that no great friction will precede the absorbing of the properties. Chicago gas is, in common with the general share market, dull and uneven, the opening to day having been made 89 to 89½. The quarterly dividend of 1½ per cent. is payable on March 23d. Bay State gas is dull and weak, at 29 to 30, Laclede common is off to 20½, and Baltimore Consolidated is neglected, at 60½. This last, however, looks to be a purchase. We note sales at auction: 93 Fulton-Municipal, at 151, and 100 shares Peoples, of Brooklyn, at 106.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

MARCH 13.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	124½	125½
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	198	200
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	35	40
Preferred	5,000,000	100	88	91x
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	130	135
Citizens	1,200,000	20	—	109
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co	2,000,000	100	45	—
Bonds	1,000,000	—	—	75
Fulton Municipal	3,000,000	100	150	151
" Bonds	300,000		102	—
Peoples	1,000,000	10	106	108
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	140	—
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	175	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	165	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	82	83
2d " " "	3,000,000	1000	64¼	—
Bay State Gas Co.—				
Stock	5,000,000	50	29	30
Income Bonds	2,000,000	1000	60	65
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	88⅞	89
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	25	—
Bonds	600,000	1000	85	90

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